


REMARKS

The claims have been amended to more clearly define the invention as disclosed in the written description. In particular, claim 19 has been made a proper singularly dependent claim depending from claim 13. In addition, the claims have been amended for clarity.

When the Examiner takes this case up for examination, it is respectfully requested that this Preliminary Amendment be taken into consideration.

Respectfully submitted,

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APPENDIX

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1. (Amended) ~~Method~~ A method for detecting motion at a temporal intermediate position between previous and next images, in which a criterion function for candidate vectors is ~~optimised~~ optimized, said function depending on data from both previous and next images and in which the ~~optimising~~ optimizing is carried out at the temporal intermediate position in non-covering and non-uncovering areas, ~~characterised~~ characterized in that the ~~optimising~~ optimizing is carried out at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas.

2. (Amended) ~~Method according to~~ The method as claimed in claim 1, wherein the previous image is shifted over a fraction  $\alpha$  times the candidate vector, the next image is shifted over  $1 - \alpha$  times the candidate vector and the fraction  $\alpha$  may change within the image period.

3. (Amended) ~~Method according to~~ The method as claimed in claim 1, wherein the criterion function is a match error which is ~~minimised~~ minimized.

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4. (Amended) ~~Method according to~~ The method as claimed in claim 2, wherein the fraction  $\alpha$  is controlled by a covering/uncovering detector in the matching process.
5. (Amended) ~~Method according to~~ The method as claimed in claim 4, wherein the fraction  $\alpha$  is set to 1 in case of covering and set to 0 in case of uncovering.
6. (Amended) ~~Method according to~~ The method as claimed in claim 4, wherein the covering/uncovering detector decides on data in a previous image to the fraction  $\alpha$  in the current estimation.
7. (Amended) ~~Method according to~~ The method as claimed in claim 1, wherein a velocity edge  $X_E$  is determined, an occlusion area is marked around said edge, and in said occlusion area, foreground velocity is replaced by background velocity or reversibly dependent on whether the occlusion area is a covering or uncovering area, the sign of the foreground velocity and on which side of the velocity edge  $X_E$  the foreground is.
8. (Amended) ~~Method according to~~ The method as claimed in claim 7, wherein at the position  $\bar{x}_i$  of a velocity edge

- a first position  $\bar{x}_a$  in the previous (covering) or next (uncovering) image is calculated by shifting  $\bar{x}_1$  over the first vector at one side of the edge

- a second position  $\bar{x}_b$  in the previous (covering) or next (uncovering) image is calculated by shifting  $\bar{x}_1$  over the second vector at the other side of the edge

- and a third intermediate position between  $\bar{x}_a$  and  $\bar{x}_b$  is

calculated

- while finally, the vector fetched with  $v_{av}$  at the third position in the previous (covering) or next (uncovering) image is filled in those regions of the image in the environment of the edge, to which no vector is projected, in case the background vector  $v_{BG}$  should be filled in, and the vector chosen between  $\bar{D}(\bar{x} - \begin{pmatrix} 1 \\ 0 \end{pmatrix}, n)$  and  $\bar{D}(\bar{x} + \begin{pmatrix} 1 \\ 0 \end{pmatrix}, n)$  which is most different from  $v_{av}$  is filled in, in case a foreground vector  $v_{FG}$  should be filled in.

9. (Amended) ~~Method according to~~ The method as claimed in claim 8, wherein the intermediate position is  $(\bar{x}_a + \bar{x}_b)/2$ .

10. (Amended) ~~Method according to~~ The method as claimed in claim 7, wherein a background velocity is identified as a velocity

which crosses the velocity discontinuity and projects to a foreground velocity in the previous picture, whereas a foreground velocity projects to itself.

11. (Amended) ~~Method according to~~ The method as claimed in claim 7, wherein near edges it is tested whether the mentioned edge has moved over the first vector on one side of the edge, or over the second vector on the other side of the edge, in case the edge moves with the first (second) vector, the second (first) vector is filled in those regions of the projected vector field in the environment of the edge, to which no vector is projected, in case a background vector  $v_{BG}$  should be filled in, and the other vector is filled in, in case a foreground vector  $v_{FG}$  should be filled.

12. (Amended) ~~Method according to~~ The method as claimed in claim 10, wherein the crossing from a background region to a foreground region in the previous image is verified by the match error of the vector in that block.

13. (Amended) ~~Apparatus~~ An apparatus for detecting motion at a temporal intermediate position between previous and next images, comprising means ~~(1) optimising~~ for optimizing a criterion function for candidate vectors, said function depending on data from both previous and next images in which the ~~optimising~~ optimizing is



17. (Amended) ~~Apparatus according to~~ The apparatus as claimed  
in claim 16, wherein the fraction  $\alpha$  is set to 1 in case of covering  
and set to 0 in case of uncovering.

18. (Amended) ~~Apparatus according to~~ The apparatus as claimed  
in claim 16, wherein the covering/uncovering detector ~~(2)~~ decides  
on data in a previous image to the fraction  $\alpha$  in the current  
estimation.

19. (Amended) ~~Apparatus according to one of the preceding~~  
~~claims~~ The apparatus as claimed in claim 13, wherein a velocity edge  
 $X_E$  is determined, an occlusion area is marked around said edge, and  
in said occlusion area, foreground velocity is replaced by  
background velocity or reversibly dependent on whether the  
occlusion area is a covering or uncovering area, the sign of the  
foreground velocity and on which side of the velocity edge  $X_E$  the  
foreground is.

20. (Amended) ~~Apparatus according to~~ The apparatus as claimed  
in claim 19, wherein said apparatus further comprises calculation  
means ~~(5,6,8)~~ are provided for, at the position  $\bar{x}_1$  of a velocity  
edge, calculating

5 • a first position  $\bar{x}_a$  in the previous (covering) or next  
(uncovering) image by shifting  $\bar{x}_1$  over the first vector at one side  
of the edge

• a second position  $\bar{x}_b$  in the previous (covering) or next  
(uncovering) image by shifting  $\bar{x}_1$  over the second vector at the  
10 other side of the edge

• and a third intermediate position between  $\bar{x}_a$  and  $\bar{x}_b$ ,

• while finally, the vector fetched with  $v_{av}$  at the third position  
in the previous (covering) or next (uncovering) image (9) is filled  
in those regions of the image in the environment of the edge, to  
which no vector is projected, in case the background vector  $\underline{v_{BG} - v_{FG}}$   
should be filled in, and the vector chosen between  $\bar{D}(\bar{x} - \begin{pmatrix} 1 \\ 0 \end{pmatrix}, n)$  and  
 $\bar{D}(\bar{x} + \begin{pmatrix} 1 \\ 0 \end{pmatrix}, n)$  which is most different from  $v_{av}$  is filled in, in case a  
foreground vector  $v_{FG}$  should be filled in.

21. (Amended) ~~Apparatus according to~~ The apparatus as claimed  
in claim 20, wherein the intermediate position is  $(\bar{x}_a + \bar{x}_b)/2$ .

22. (Amended) ~~Apparatus according to~~ The apparatus as claimed  
in claim 19, wherein said apparatus further comprises means



(10,11)are ~~provided~~ for projecting two positions on either side of the edge to the previous (covering) or next (uncovering) image, in which a background velocity is identified ~~(14)~~ as a velocity which crosses the velocity discontinuity and projects to a foreground velocity in the previous picture, whereas a foreground velocity projects to itself.

23. (Amended) ~~Apparatus according to~~ The apparatus as claimed in claim 19, wherein said apparatus further comprises means ~~(20)~~ ~~are provided~~ for testing near edges whether the mentioned edge has moved over the first vector on one side of the edge, or over the second vector on the other side of the edge, in case the edge moves with the first (second) vector, the second (first) vector is filled in those regions of the projected vector field in the environment of the edge, to which no vector is projected, in case a background vector  $v_{BG}$  should be filled in, and the other vector is filled in, in case a foreground vector  $v_{FG}$  should be filled.

24. (Amended) ~~Apparatus according to~~ The apparatus as claimed in claim 22, wherein said apparatus further comprises verification means ~~are provided~~ for verifying the crossing from a background region to a foreground region in the previous image by the match error of the vector in that block.

25. (Amended) ~~Image~~ An image display apparatus comprising  
~~detection~~ apparatus ~~(21)~~ for ~~detection~~ detecting a motion vector  
according to as claimed in claim 13, means ~~(22)~~ for interpolating  
image parts connected to said ~~detection~~ detecting apparatus, ~~(21)~~  
5 and a display device ~~(23)~~ connected to the interpolating means.

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